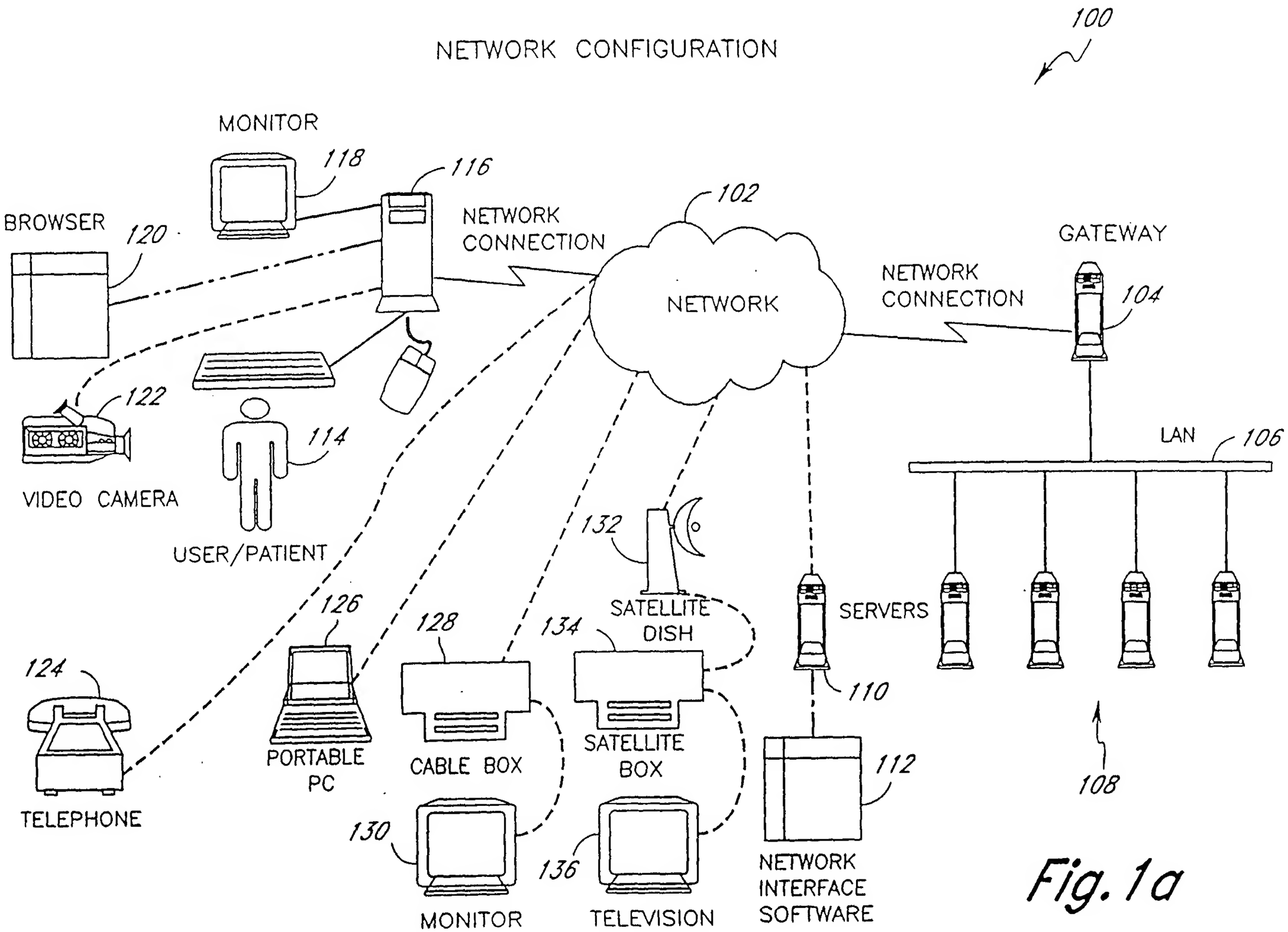
NETWORK CONFIGURATION
100
MONITOR
118
116
BROWSER
120
NETWORK CONNECTION
102
NETWORK
GATEWAY
NETWORK CONNECTION
104
LAN
106
122
VIDEO CAMERA
114
USER/PATIENT
132
SATELLITE DISH
SERVERS
110
126
128
134
124
PORTABLE PC
CABLE BOX
SATELLITE BOX
112
TELEPHONE
130
136
MONITOR
TELEVISION
NETWORK INTERFACE SOFTWARE
108

Fig. 1a

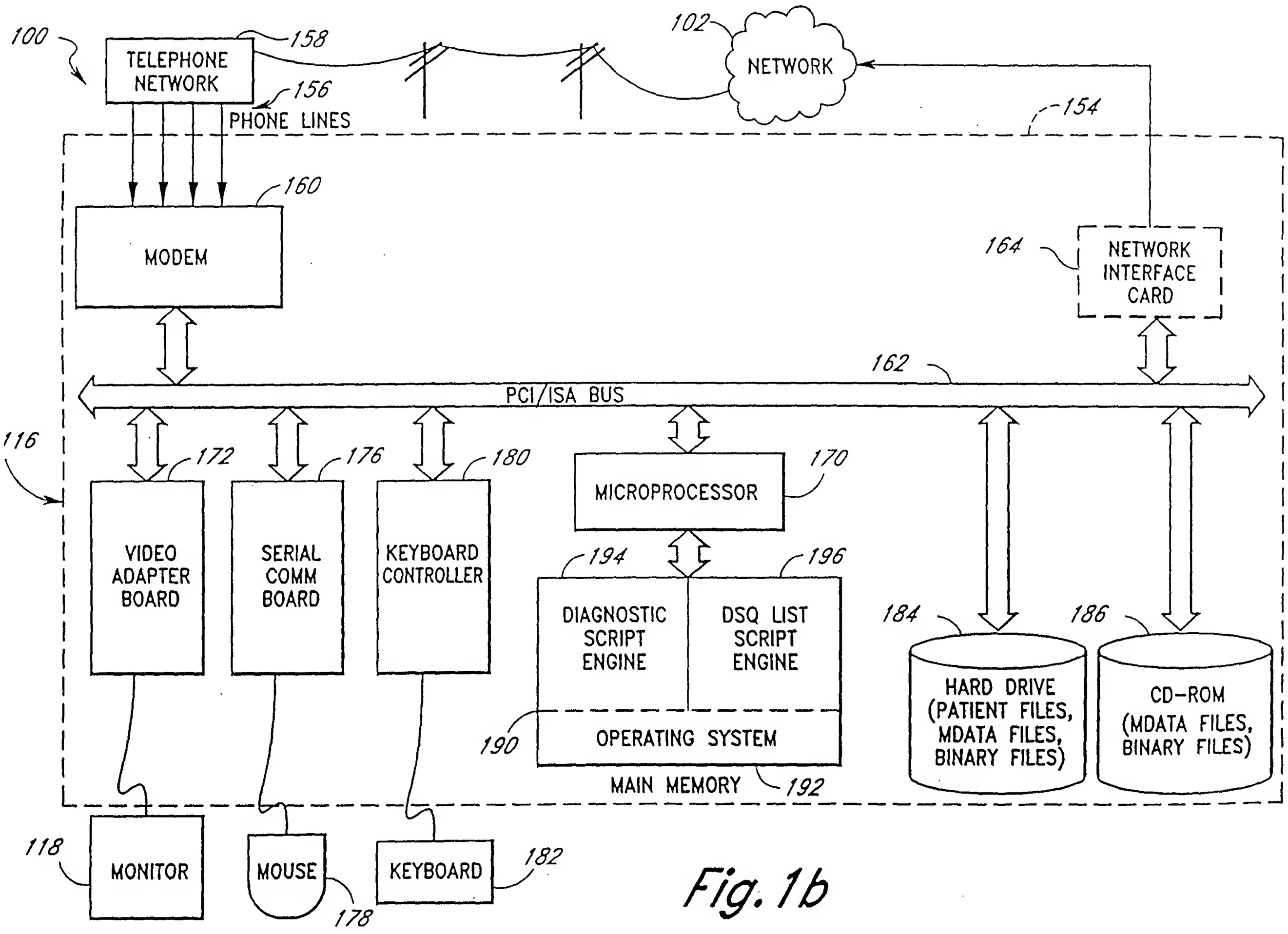
100
TELEPHONE NETWORK
158
156
PHONE LINES
102
NETWORK
154
160
MODEM
164
NETWORK INTERFACE CARD
162
PCI/ISA BUS
116
172
176
180
170
MICROPROCESSOR
VIDEO ADAPTER BOARD
SERIAL COMM BOARD
KEYBOARD CONTROLLER
194
196
DIAGNOSTIC SCRIPT ENGINE
DSQ LIST SCRIPT ENGINE
184
186
HARD DRIVE (PATIENT FILES, MDATA FILES, BINARY FILES)
CD-ROM (MDATA FILES, BINARY FILES)
190
OPERATING SYSTEM
MAIN MEMORY
192
118
MONITOR
MOUSE
178
KEYBOARD
182

Fig. 1b

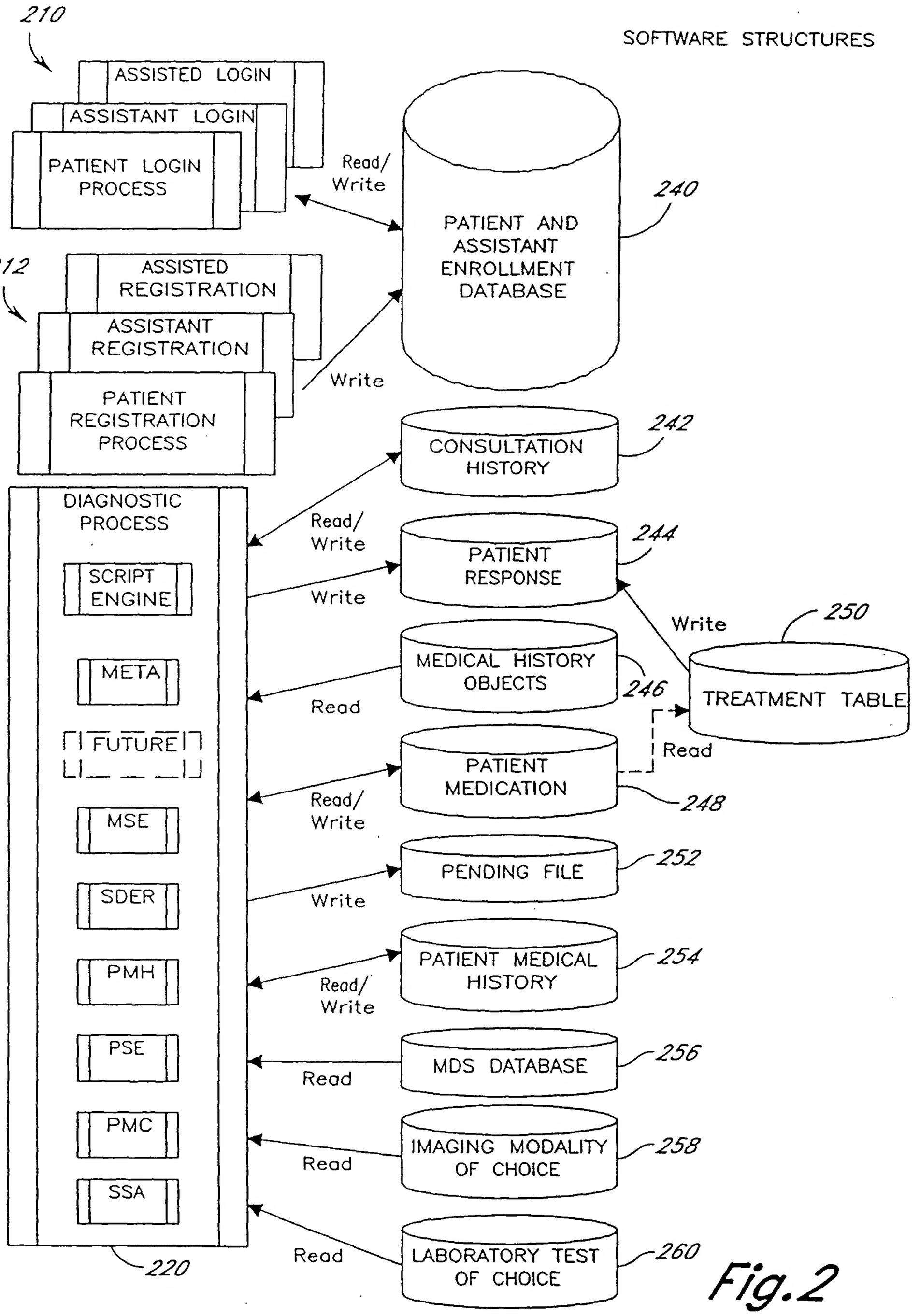
210
SOFTWARE STRUCTURES
ASSISTED LOGIN
ASSISTANT LOGIN
PATIENT LOGIN PROCESS
212
ASSISTED REGISTRATION
ASSISTANT REGISTRATION
PATIENT REGISTRATION PROCESS
DIAGNOSTIC PROCESS
SCRIPT ENGINE
META
FUTURE
MSE
SDER
PMH
PSE
PMC
SSA
220
Read/ Write
Write
Read/ Write
Write
Read
Read/ Write
Write
Read/ Write
Read
Read
240
PATIENT AND ASSISTANT ENROLLMENT DATABASE
242
CONSULTATION HISTORY
244
PATIENT RESPONSE
246
MEDICAL HISTORY OBJECTS
248
PATIENT MEDICATION
250
TREATMENT TABLE
252
PENDING FILE
254
PATIENT MEDICAL HISTORY
256
MDS DATABASE
258
IMAGING MODALITY OF CHOICE
260
LABORATORY TEST OF CHOICE
Write
Read

Fig.2

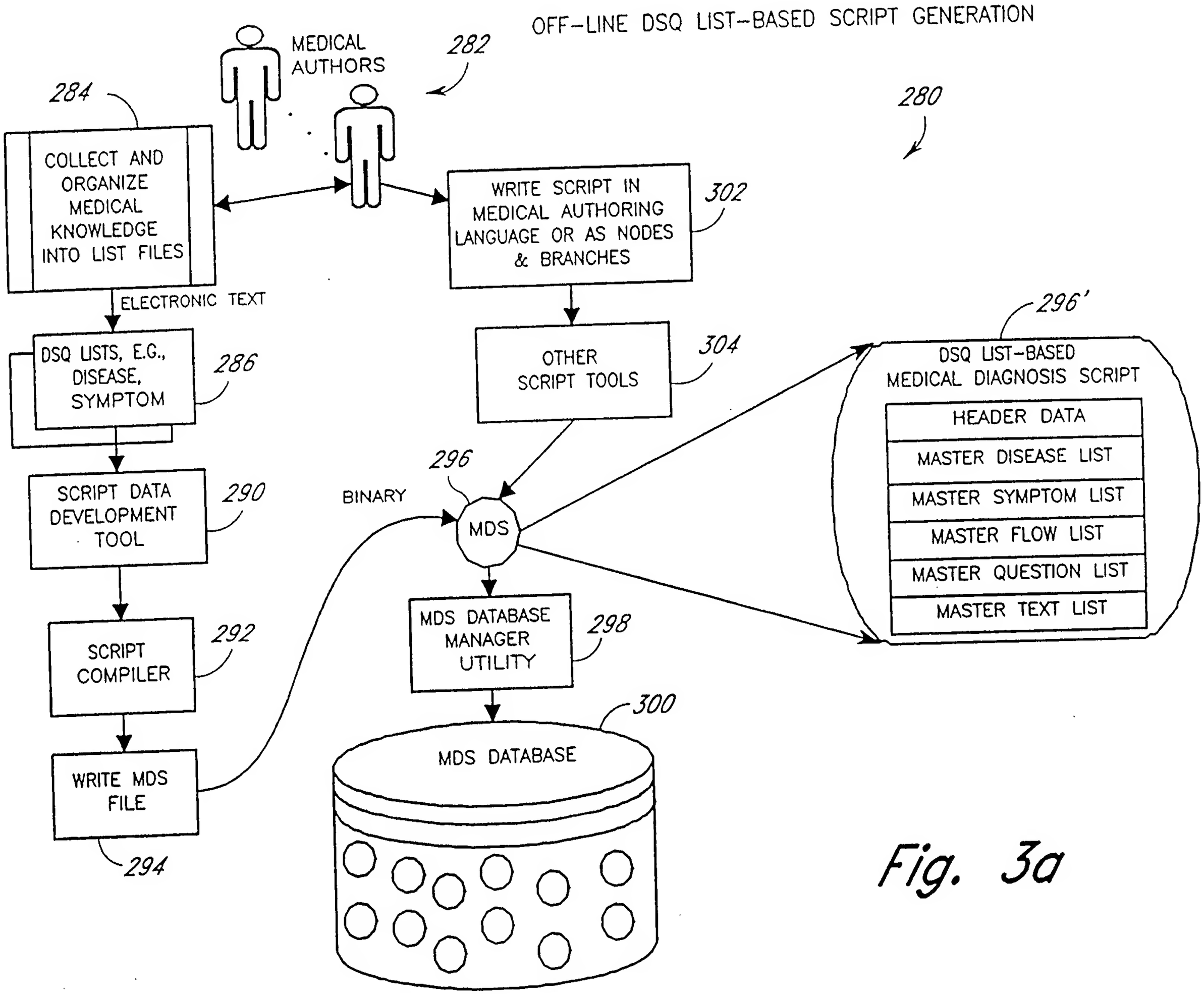
OFF-LINE DSQ LIST-BASED SCRIPT GENERATION
280
MEDICAL AUTHORS
282
284
COLLECT AND ORGANIZE MEDICAL KNOWLEDGE INTO LIST FILES
ELECTRONIC TEXT
DSQ LISTS, E.G., DISEASE, SYMPTOM
286
SCRIPT DATA DEVELOPMENT TOOL
290
SCRIPT COMPILER
292
WRITE MDS FILE
294
WRITE SCRIPT IN MEDICAL AUTHORING LANGUAGE OR AS NODES & BRANCHES
302
OTHER SCRIPT TOOLS
304
296'
DSQ LIST-BASED MEDICAL DIAGNOSIS SCRIPT
HEADER DATA
MASTER DISEASE LIST
MASTER SYMPTOM LIST
MASTER FLOW LIST
MASTER QUESTION LIST
MASTER TEXT LIST
296
BINARY
MDS
MDS DATABASE MANAGER UTILITY
298
300
MDS DATABASE

Fig. 3a

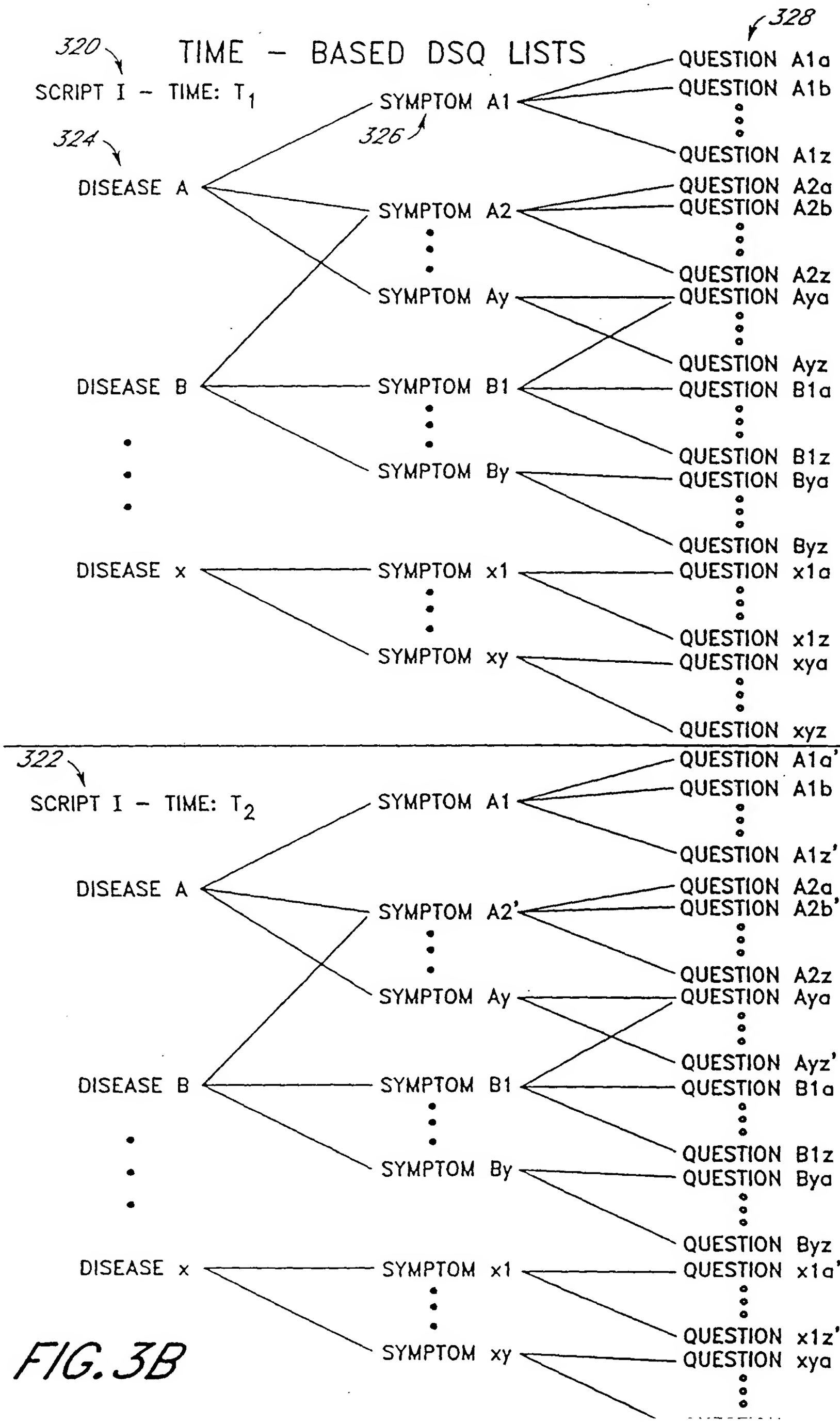
TIME - BASED DSQ LISTS
320
328
SCRIPT I - TIME: T_1
324
326
DISEASE A
DISEASE B
DISEASE x
SYMPTOM A1
SYMPTOM A2
SYMPTOM Ay
SYMPTOM B1
SYMPTOM By
SYMPTOM x1
SYMPTOM xy
QUESTION A1a
QUESTION A1b
QUESTION A1z
QUESTION A2a
QUESTION A2b
QUESTION A2z
QUESTION Aya
QUESTION Ayz
QUESTION B1a
QUESTION B1z
QUESTION Bya
QUESTION Byz
QUESTION x1a
QUESTION x1z
QUESTION xya
QUESTION xyz
322
SCRIPT I - TIME: T_2
DISEASE A
DISEASE B
DISEASE x
SYMPTOM A1
SYMPTOM A2'
SYMPTOM Ay
SYMPTOM B1
SYMPTOM By
SYMPTOM x1
SYMPTOM xy
QUESTION A1a'
QUESTION A1b
QUESTION A1z'
QUESTION A2a
QUESTION A2b'
QUESTION A2z
QUESTION Aya
QUESTION Ayz'
QUESTION B1a
QUESTION B1z
QUESTION Bya
QUESTION Byz
QUESTION x1a'
QUESTION x1z'
QUESTION xya

FIG. 3B

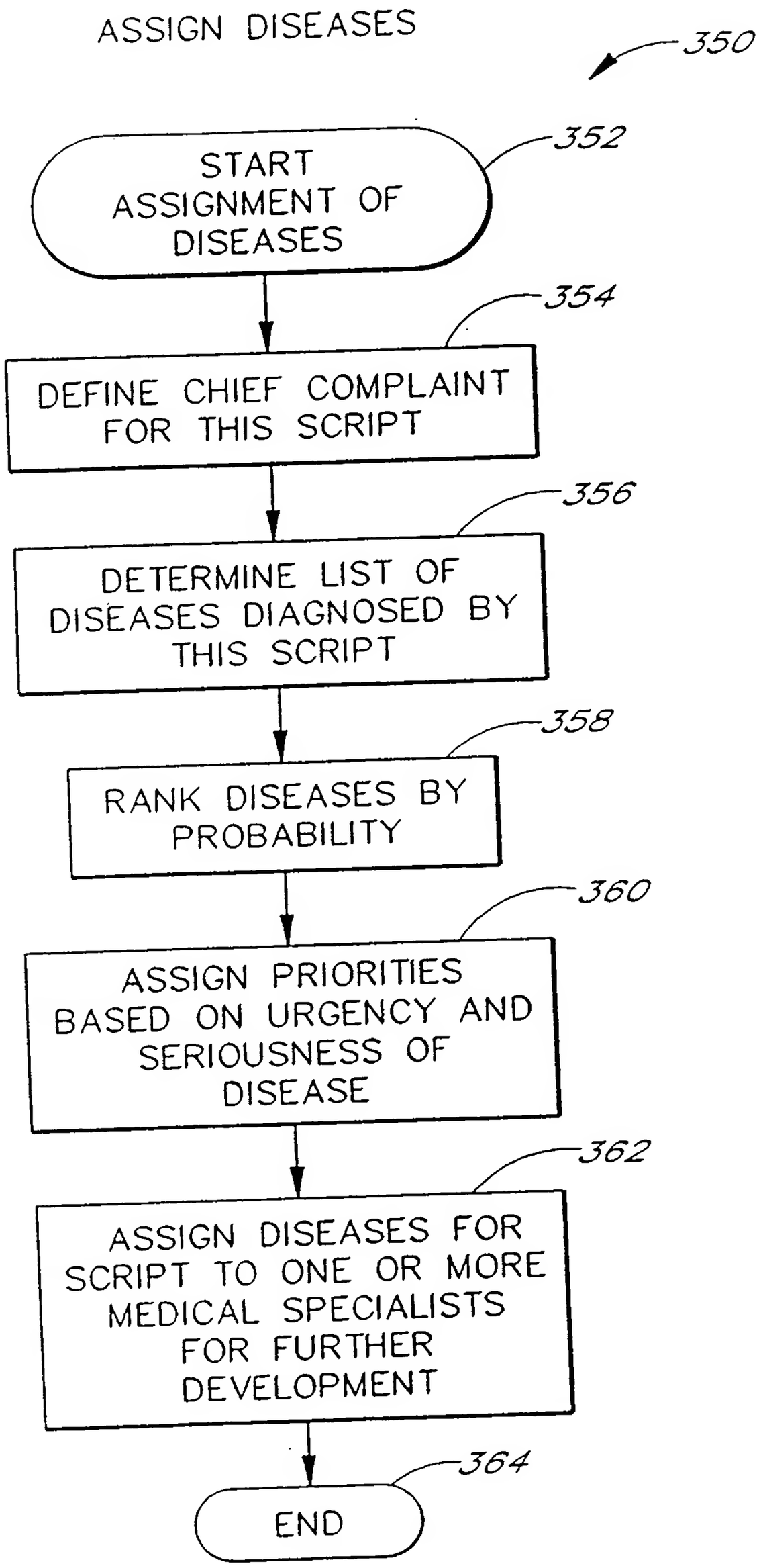
ASSIGN DISEASES
350
START ASSIGNMENT OF DISEASES
352
DEFINE CHIEF COMPLAINT FOR THIS SCRIPT
354
DETERMINE LIST OF DISEASES DIAGNOSED BY THIS SCRIPT
356
RANK DISEASES BY PROBABILITY
358
ASSIGN PRIORITIES BASED ON URGENCY AND SERIOUSNESS OF DISEASE
360
ASSIGN DISEASES FOR SCRIPT TO ONE OR MORE MEDICAL SPECIALISTS FOR FURTHER DEVELOPMENT
362
END
364

FIG. 4a

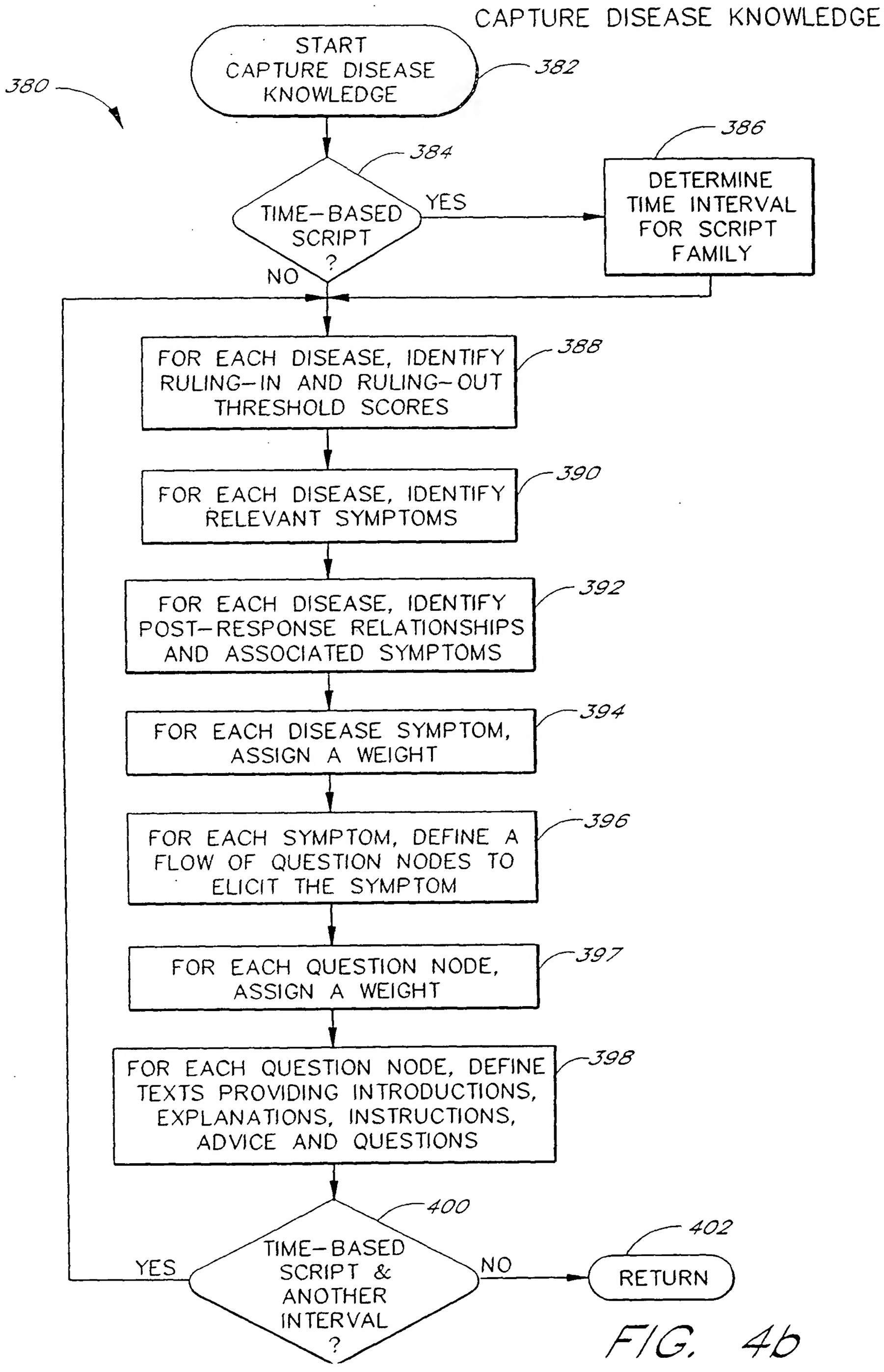
CAPTURE DISEASE KNOWLEDGE
380
START CAPTURE DISEASE KNOWLEDGE
382
384
TIME-BASED SCRIPT ?
YES
386
DETERMINE TIME INTERVAL FOR SCRIPT FAMILY
NO
FOR EACH DISEASE, IDENTIFY RULING-IN AND RULING-OUT THRESHOLD SCORES
388
FOR EACH DISEASE, IDENTIFY RELEVANT SYMPTOMS
390
FOR EACH DISEASE, IDENTIFY POST-RESPONSE RELATIONSHIPS AND ASSOCIATED SYMPTOMS
392
FOR EACH DISEASE SYMPTOM, ASSIGN A WEIGHT
394
FOR EACH SYMPTOM, DEFINE A FLOW OF QUESTION NODES TO ELICIT THE SYMPTOM
396
FOR EACH QUESTION NODE, ASSIGN A WEIGHT
397
FOR EACH QUESTION NODE, DEFINE TEXTS PROVIDING INTRODUCTIONS, EXPLANATIONS, INSTRUCTIONS, ADVICE AND QUESTIONS
398
TIME-BASED SCRIPT & ANOTHER INTERVAL ?
400
YES
NO
RETURN
402

FIG. 4b

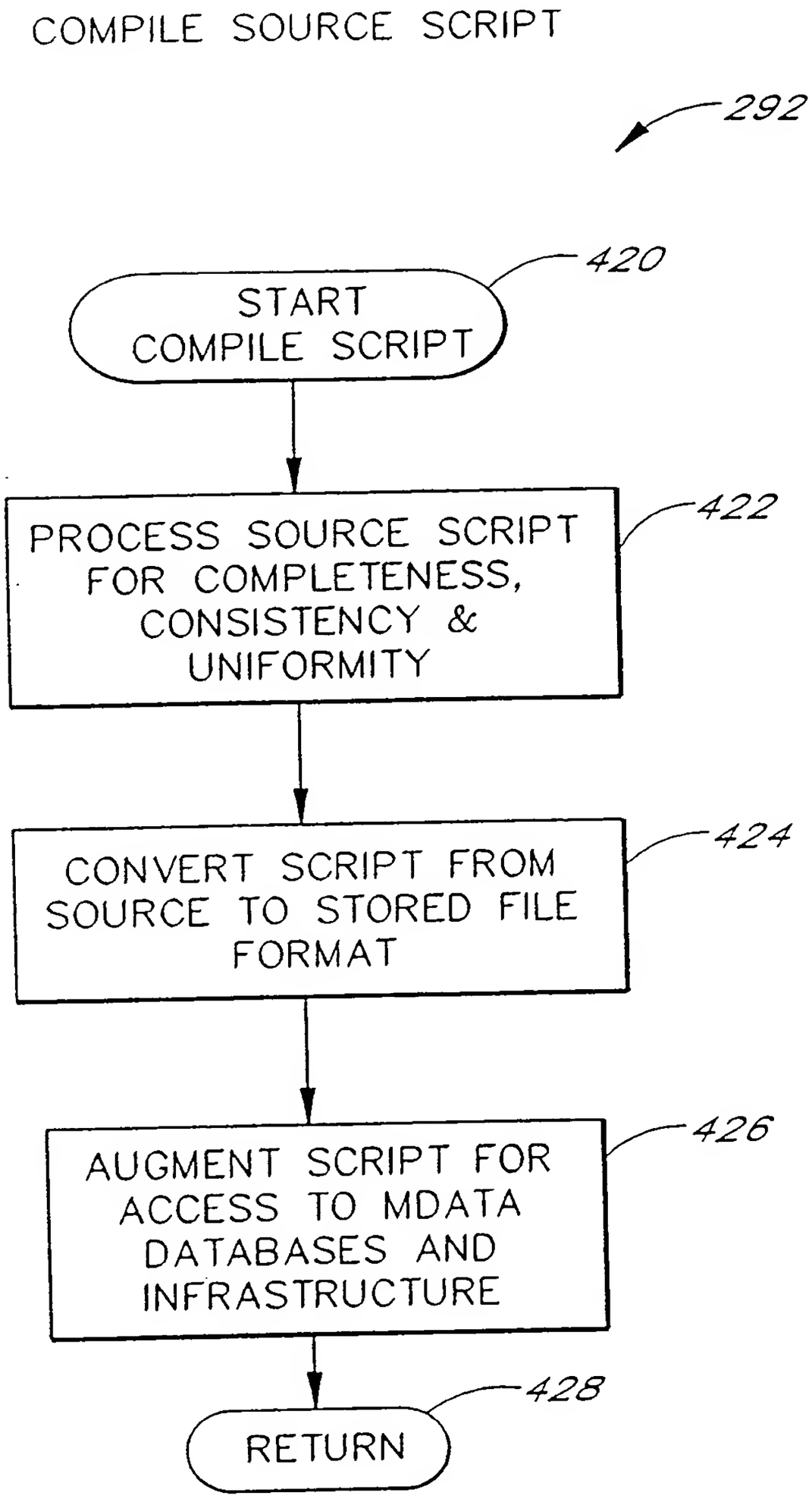
COMPILE SOURCE SCRIPT
292
START COMPILE SCRIPT
420
PROCESS SOURCE SCRIPT FOR COMPLETENESS, CONSISTENCY & UNIFORMITY
422
CONVERT SCRIPT FROM SOURCE TO STORED FILE FORMAT
424
AUGMENT SCRIPT FOR ACCESS TO MDATA DATABASES AND INFRASTRUCTURE
426
RETURN
428

FIG. 5

GENERAL OPERATION OF DIAGNOSTIC SCRIPT ENGINE

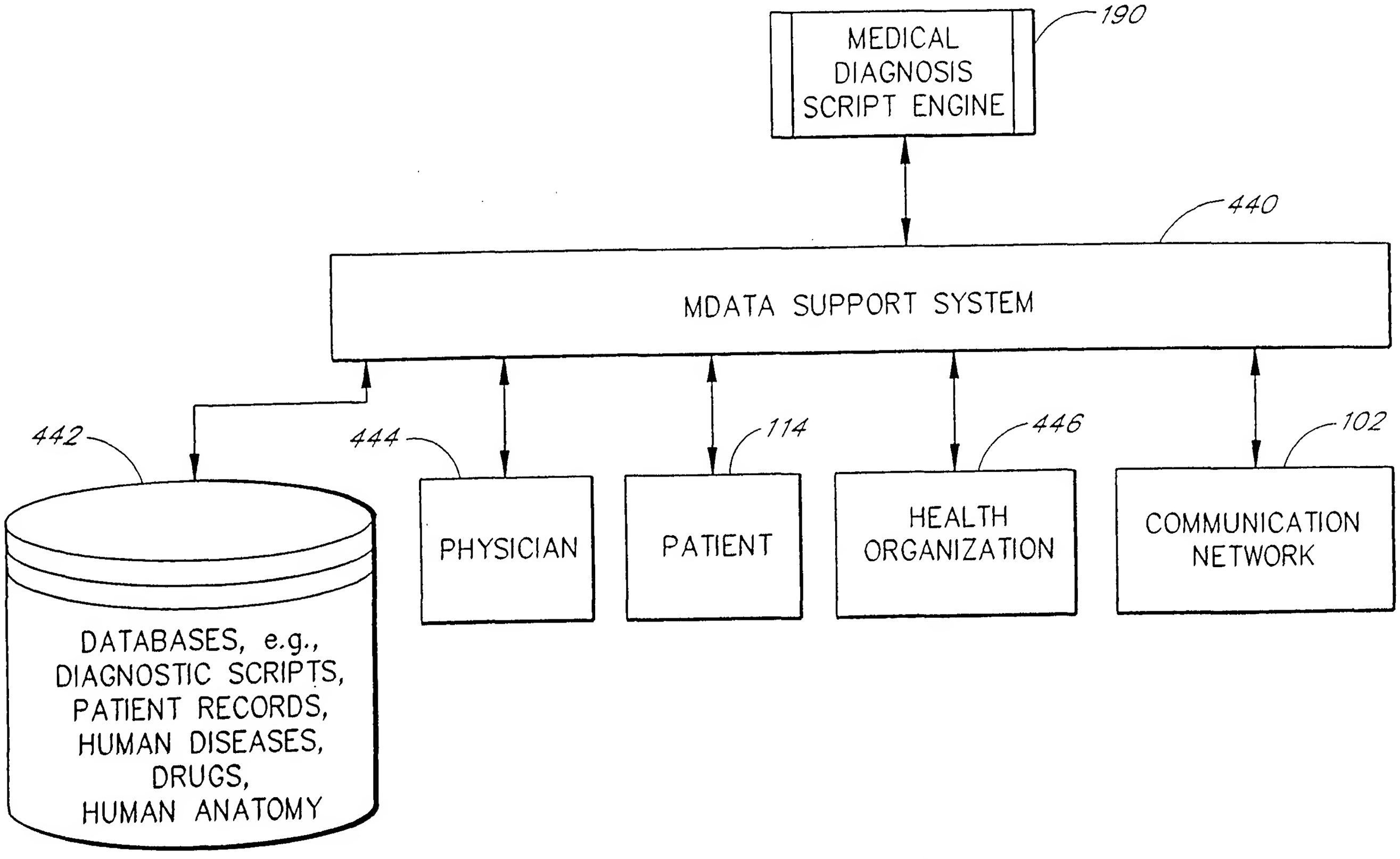

FIG. 6a

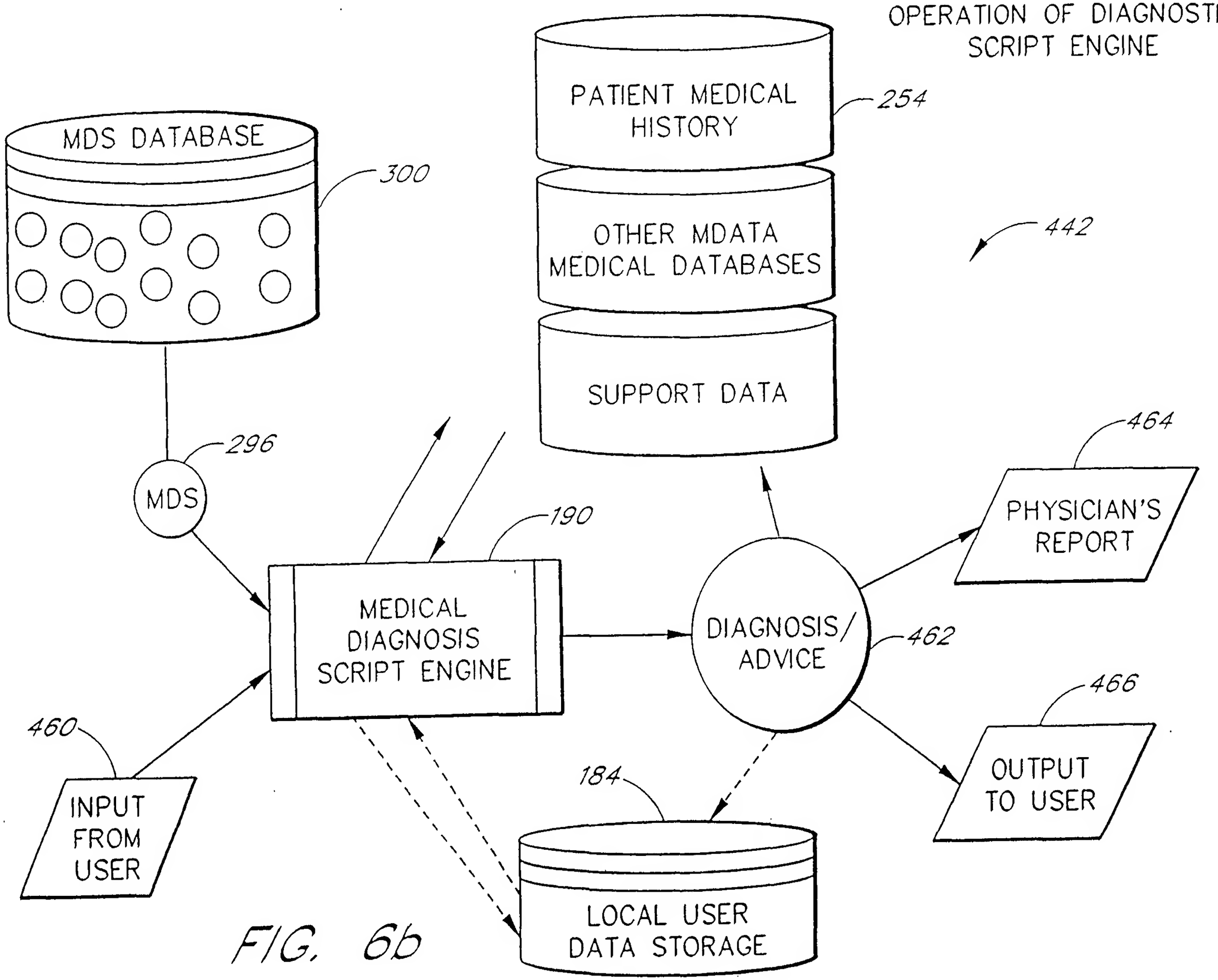
OPERATION OF DIAGNOSTIC SCRIPT ENGINE
PATIENT MEDICAL HISTORY
254
OTHER MDATA MEDICAL DATABASES
442
SUPPORT DATA
MDS DATABASE
300
296
MDS
190
MEDICAL DIAGNOSIS SCRIPT ENGINE
460
INPUT FROM USER
DIAGNOSIS/ ADVICE
462
464
PHYSICIAN'S REPORT
466
OUTPUT TO USER
184
LOCAL USER DATA STORAGE

FIG. 6b

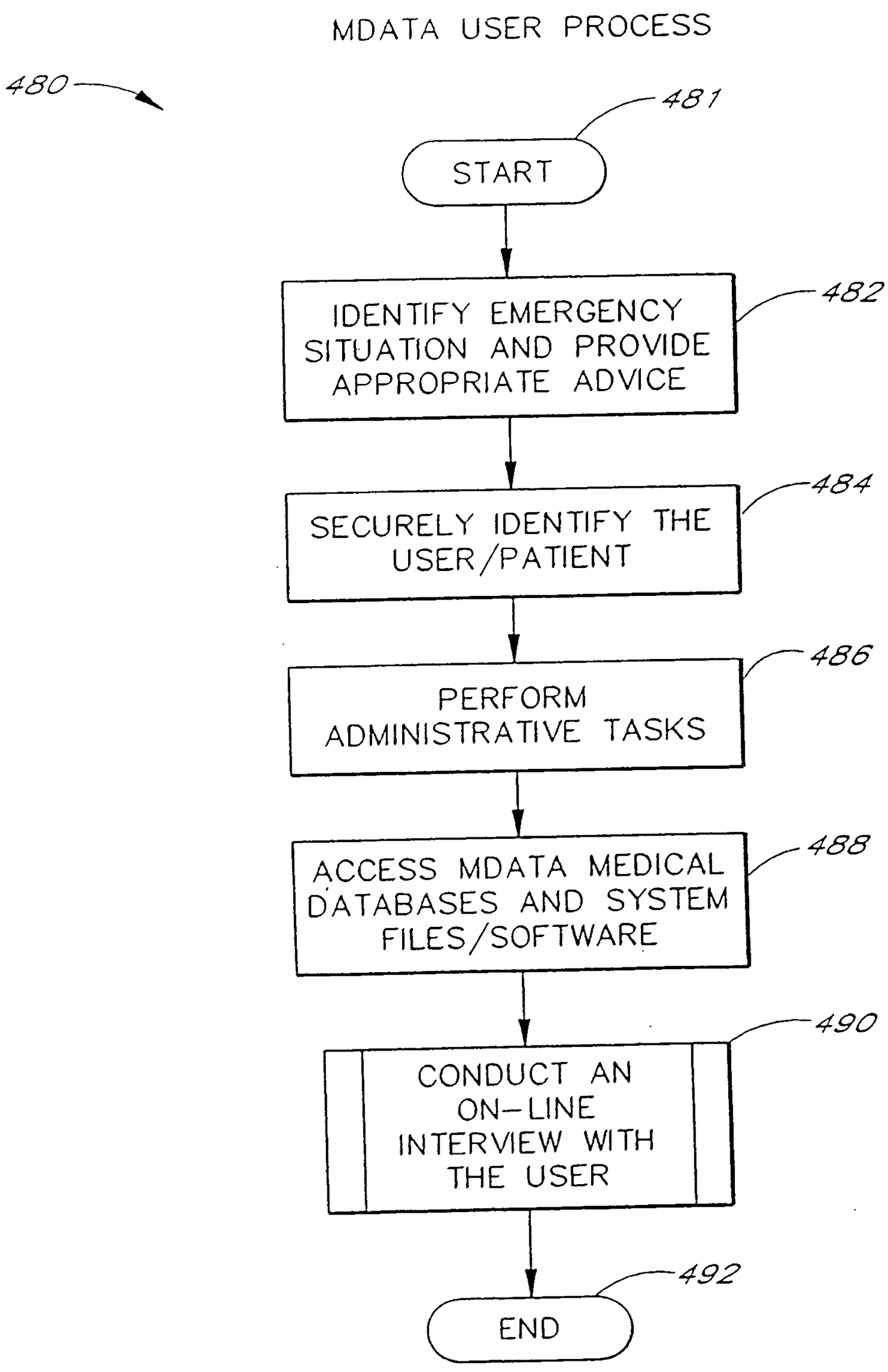
MDATA USER PROCESS
480
481
START
IDENTIFY EMERGENCY SITUATION AND PROVIDE APPROPRIATE ADVICE
482
SECURELY IDENTIFY THE USER/PATIENT
484
PERFORM ADMINISTRATIVE TASKS
486
ACCESS MDATA MEDICAL DATABASES AND SYSTEM FILES/SOFTWARE
488
CONDUCT AN ON-LINE INTERVIEW WITH THE USER
490
END
492

FIG. 7

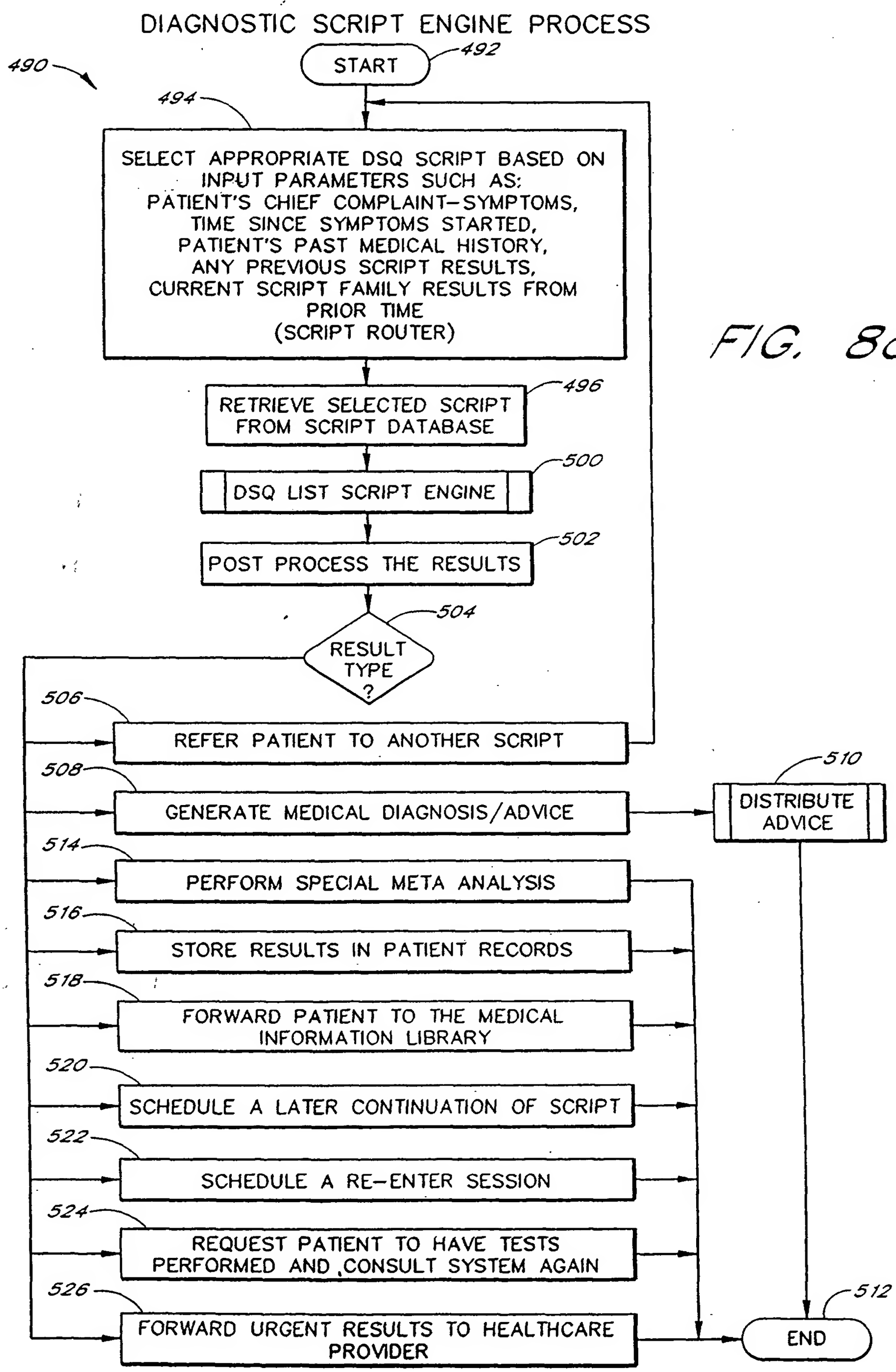
DIAGNOSTIC SCRIPT ENGINE PROCESS
490
START
492
494
SELECT APPROPRIATE DSQ SCRIPT BASED ON INPUT PARAMETERS SUCH AS: PATIENT'S CHIEF COMPLAINT–SYMPTOMS, TIME SINCE SYMPTOMS STARTED, PATIENT'S PAST MEDICAL HISTORY, ANY PREVIOUS SCRIPT RESULTS, CURRENT SCRIPT FAMILY RESULTS FROM PRIOR TIME (SCRIPT ROUTER)
496
RETRIEVE SELECTED SCRIPT FROM SCRIPT DATABASE
500
DSQ LIST SCRIPT ENGINE
502
POST PROCESS THE RESULTS
504
RESULT TYPE ?
506
REFER PATIENT TO ANOTHER SCRIPT
508
GENERATE MEDICAL DIAGNOSIS/ADVICE
510
DISTRIBUTE ADVICE
514
PERFORM SPECIAL META ANALYSIS
516
STORE RESULTS IN PATIENT RECORDS
518
FORWARD PATIENT TO THE MEDICAL INFORMATION LIBRARY
520
SCHEDULE A LATER CONTINUATION OF SCRIPT
522
SCHEDULE A RE–ENTER SESSION
524
REQUEST PATIENT TO HAVE TESTS PERFORMED AND CONSULT SYSTEM AGAIN
526
FORWARD URGENT RESULTS TO HEALTHCARE PROVIDER
512
END

FIG. 80

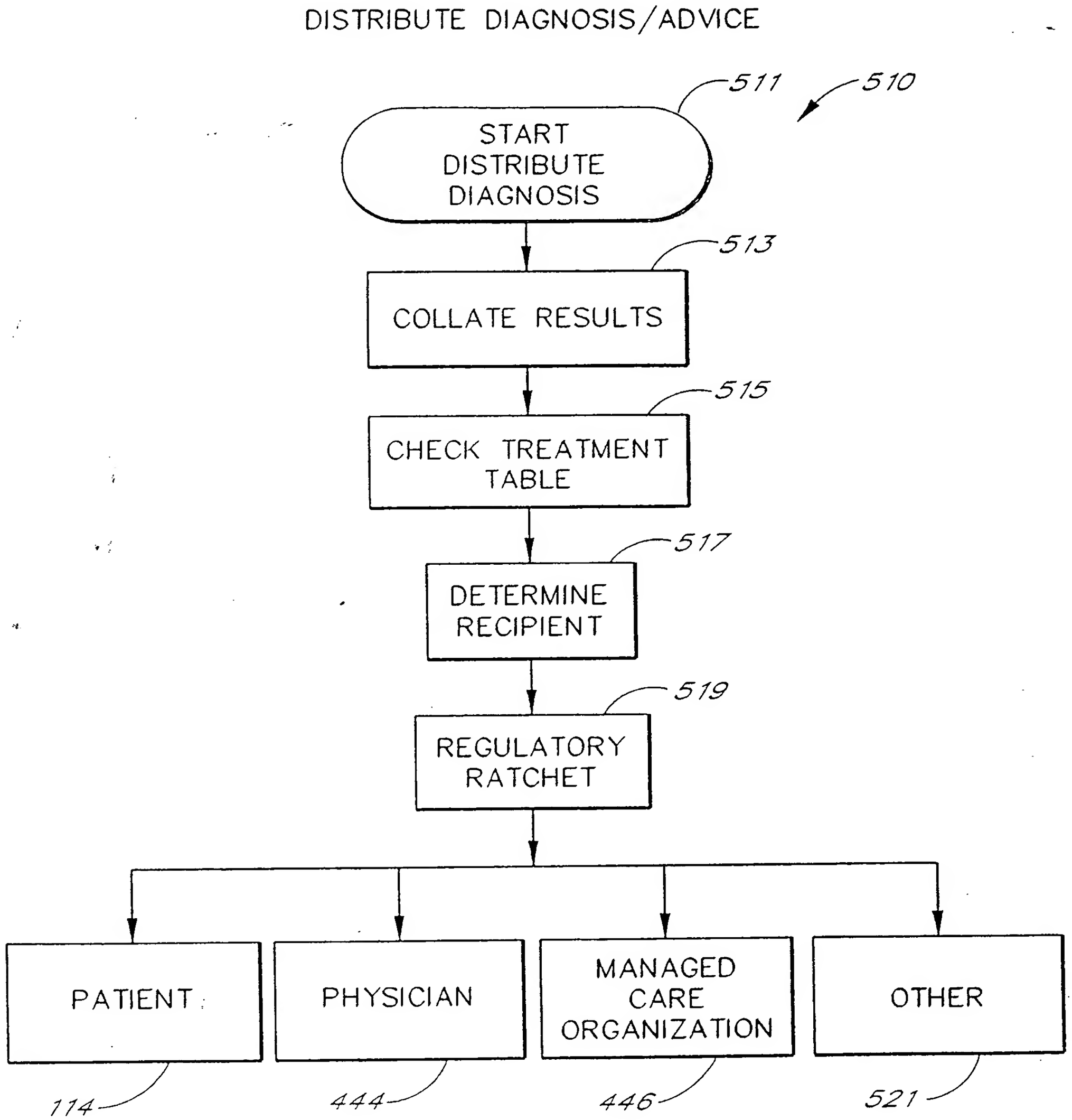
DISTRIBUTE DIAGNOSIS/ADVICE
511
510
START DISTRIBUTE DIAGNOSIS
513
COLLATE RESULTS
515
CHECK TREATMENT TABLE
517
DETERMINE RECIPIENT
519
REGULATORY RATCHET
PATIENT
PHYSICIAN
MANAGED CARE ORGANIZATION
OTHER
114
444
446
521

FIG. 8b

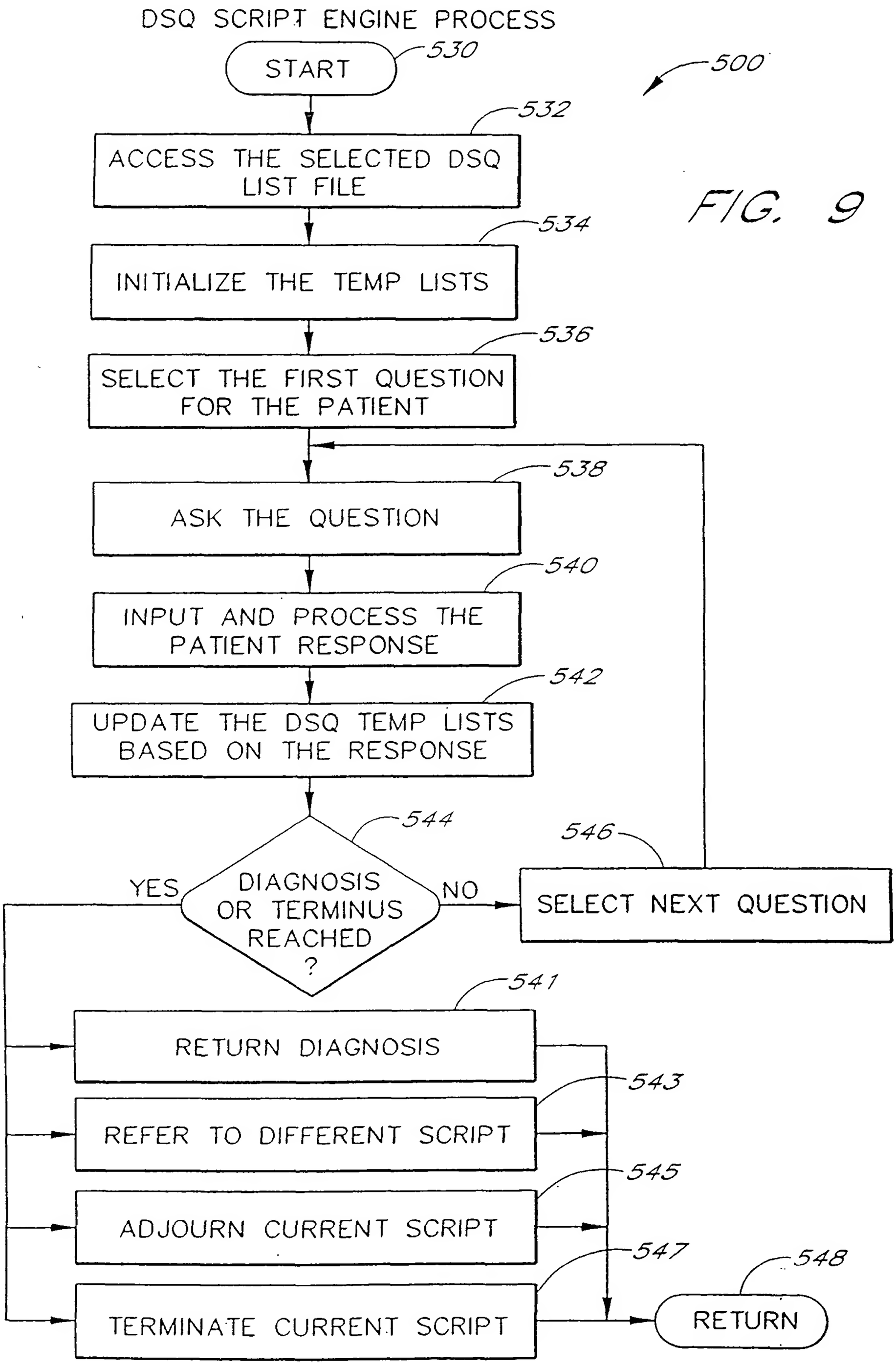
DSQ SCRIPT ENGINE PROCESS
500
START
530
ACCESS THE SELECTED DSQ LIST FILE
532
INITIALIZE THE TEMP LISTS
534
SELECT THE FIRST QUESTION FOR THE PATIENT
536
ASK THE QUESTION
538
INPUT AND PROCESS THE PATIENT RESPONSE
540
UPDATE THE DSQ TEMP LISTS BASED ON THE RESPONSE
542
DIAGNOSIS OR TERMINUS REACHED ?
544
YES
NO
SELECT NEXT QUESTION
546
RETURN DIAGNOSIS
541
REFER TO DIFFERENT SCRIPT
543
ADJOURN CURRENT SCRIPT
545
TERMINATE CURRENT SCRIPT
547
RETURN
548

FIG. 9

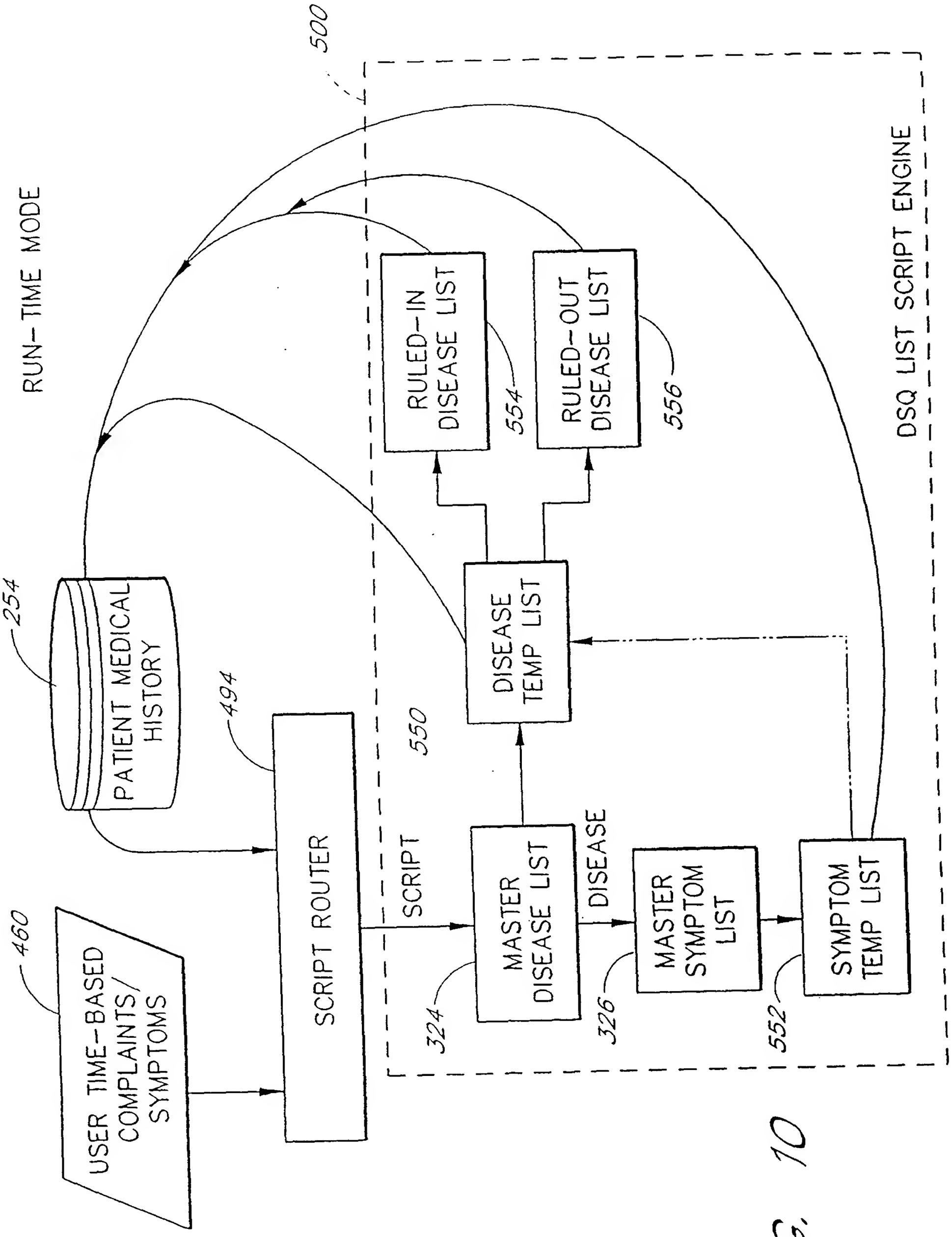
500
RUN-TIME MODE
DSQ LIST SCRIPT ENGINE
254
PATIENT MEDICAL HISTORY
494
SCRIPT ROUTER
460
USER TIME-BASED COMPLAINTS/ SYMPTOMS
550
SCRIPT
DISEASE TEMP LIST
RULED-IN DISEASE LIST
554
RULED-OUT DISEASE LIST
556
324
MASTER DISEASE LIST
326
MASTER SYMPTOM LIST
552
SYMPTOM TEMP LIST

FIG. 10

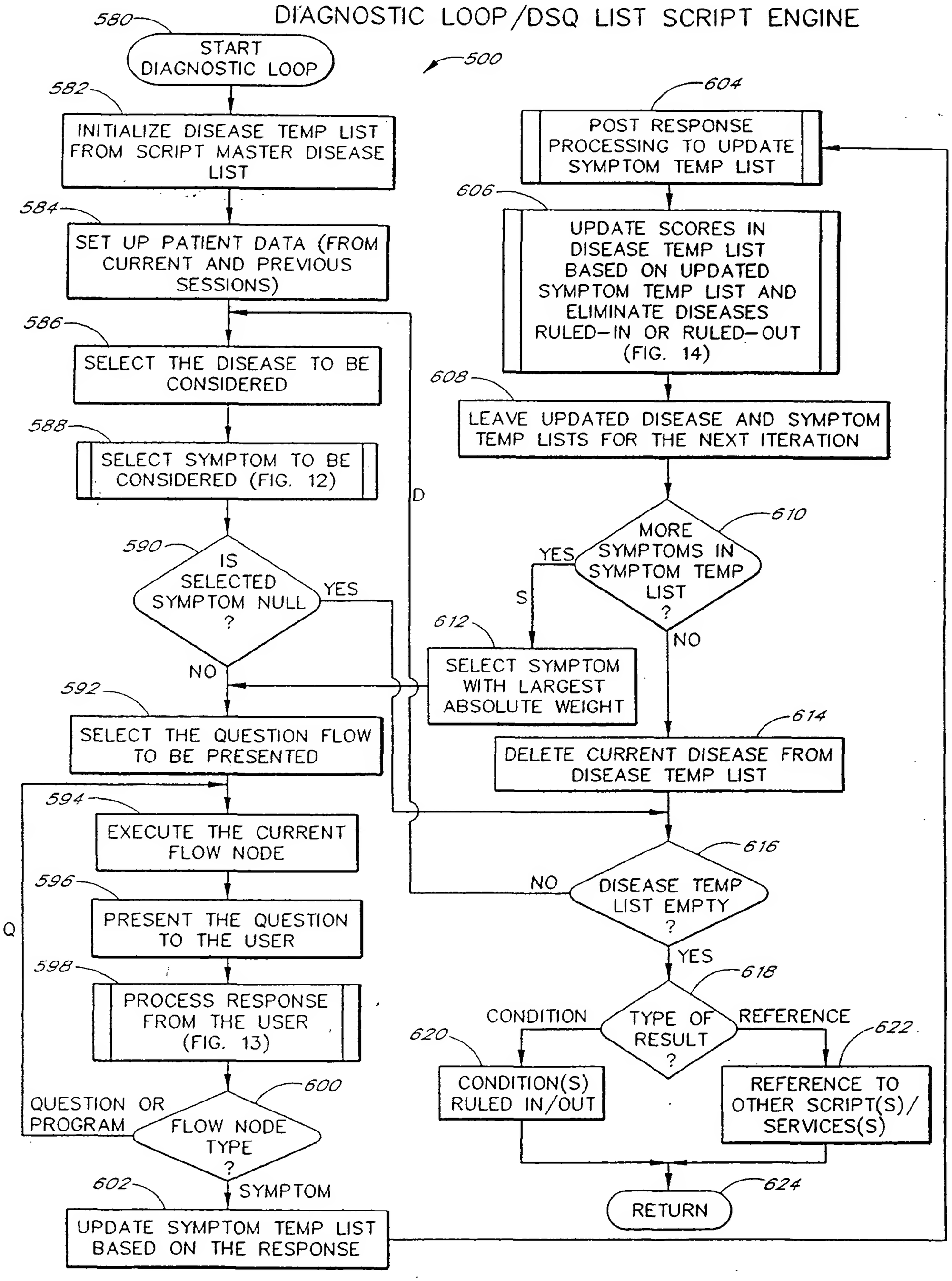
DIAGNOSTIC LOOP/DSQ LIST SCRIPT ENGINE
500
580
START DIAGNOSTIC LOOP
582
INITIALIZE DISEASE TEMP LIST FROM SCRIPT MASTER DISEASE LIST
584
SET UP PATIENT DATA (FROM CURRENT AND PREVIOUS SESSIONS)
586
SELECT THE DISEASE TO BE CONSIDERED
588
SELECT SYMPTOM TO BE CONSIDERED (FIG. 12)
590
IS SELECTED SYMPTOM NULL ?
YES
NO
592
SELECT THE QUESTION FLOW TO BE PRESENTED
594
EXECUTE THE CURRENT FLOW NODE
596
PRESENT THE QUESTION TO THE USER
598
PROCESS RESPONSE FROM THE USER (FIG. 13)
600
QUESTION OR PROGRAM
FLOW NODE TYPE ?
SYMPTOM
602
UPDATE SYMPTOM TEMP LIST BASED ON THE RESPONSE
Q
D
604
POST RESPONSE PROCESSING TO UPDATE SYMPTOM TEMP LIST
606
UPDATE SCORES IN DISEASE TEMP LIST BASED ON UPDATED SYMPTOM TEMP LIST AND ELIMINATE DISEASES RULED-IN OR RULED-OUT (FIG. 14)
608
LEAVE UPDATED DISEASE AND SYMPTOM TEMP LISTS FOR THE NEXT ITERATION
610
MORE SYMPTOMS IN SYMPTOM TEMP LIST ?
YES
NO
S
612
SELECT SYMPTOM WITH LARGEST ABSOLUTE WEIGHT
614
DELETE CURRENT DISEASE FROM DISEASE TEMP LIST
616
DISEASE TEMP LIST EMPTY ?
NO
YES
618
TYPE OF RESULT ?
CONDITION
REFERENCE
620
CONDITION(S) RULED IN/OUT
622
REFERENCE TO OTHER SCRIPT(S)/ SERVICES(S)
624
RETURN

FIG. 11

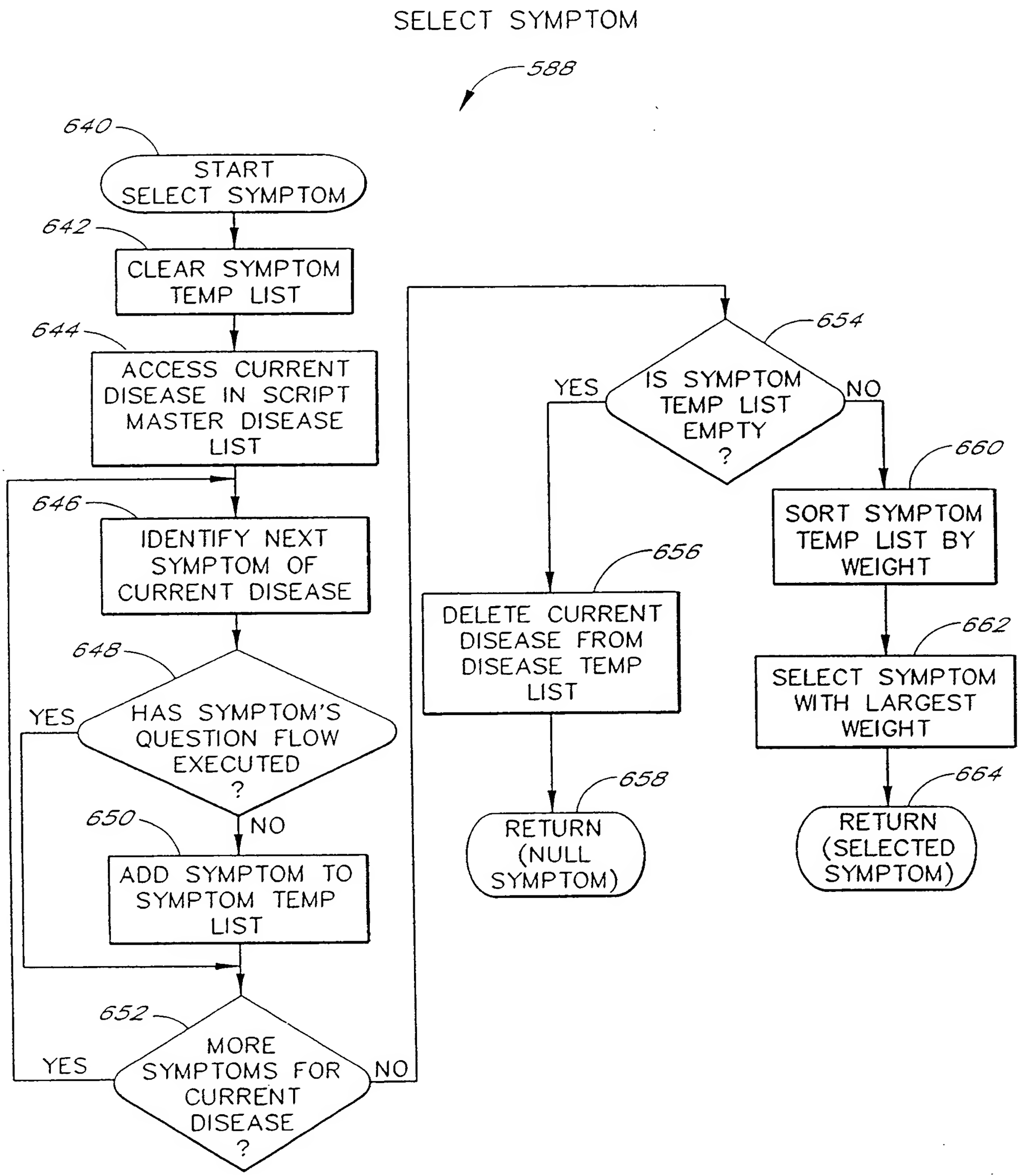
SELECT SYMPTOM
588
640
START SELECT SYMPTOM
642
CLEAR SYMPTOM TEMP LIST
644
ACCESS CURRENT DISEASE IN SCRIPT MASTER DISEASE LIST
646
IDENTIFY NEXT SYMPTOM OF CURRENT DISEASE
648
HAS SYMPTOM'S QUESTION FLOW EXECUTED ?
YES
NO
650
ADD SYMPTOM TO SYMPTOM TEMP LIST
652
MORE SYMPTOMS FOR CURRENT DISEASE ?
YES
NO
654
IS SYMPTOM TEMP LIST EMPTY ?
YES
NO
656
DELETE CURRENT DISEASE FROM DISEASE TEMP LIST
658
RETURN (NULL SYMPTOM)
660
SORT SYMPTOM TEMP LIST BY WEIGHT
662
SELECT SYMPTOM WITH LARGEST WEIGHT
664
RETURN (SELECTED SYMPTOM)

FIG. 12

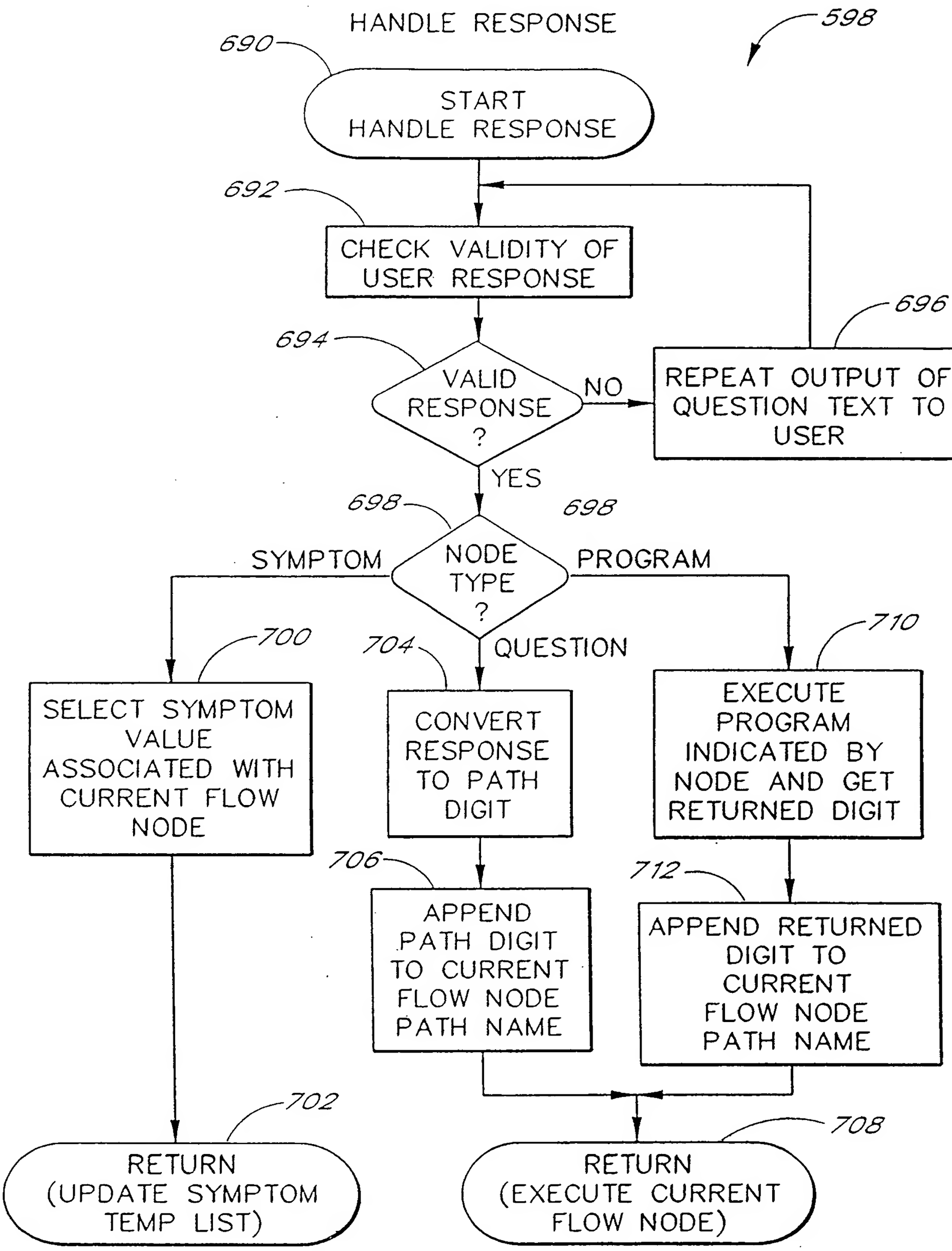
HANDLE RESPONSE
598
690
START HANDLE RESPONSE
692
CHECK VALIDITY OF USER RESPONSE
694
VALID RESPONSE ?
NO
696
REPEAT OUTPUT OF QUESTION TEXT TO USER
YES
698
698
NODE TYPE ?
SYMPTOM
PROGRAM
QUESTION
700
SELECT SYMPTOM VALUE ASSOCIATED WITH CURRENT FLOW NODE
704
CONVERT RESPONSE TO PATH DIGIT
710
EXECUTE PROGRAM INDICATED BY NODE AND GET RETURNED DIGIT
706
APPEND PATH DIGIT TO CURRENT FLOW NODE PATH NAME
712
APPEND RETURNED DIGIT TO CURRENT FLOW NODE PATH NAME
702
RETURN (UPDATE SYMPTOM TEMP LIST)
708
RETURN (EXECUTE CURRENT FLOW NODE)

FIG. 13

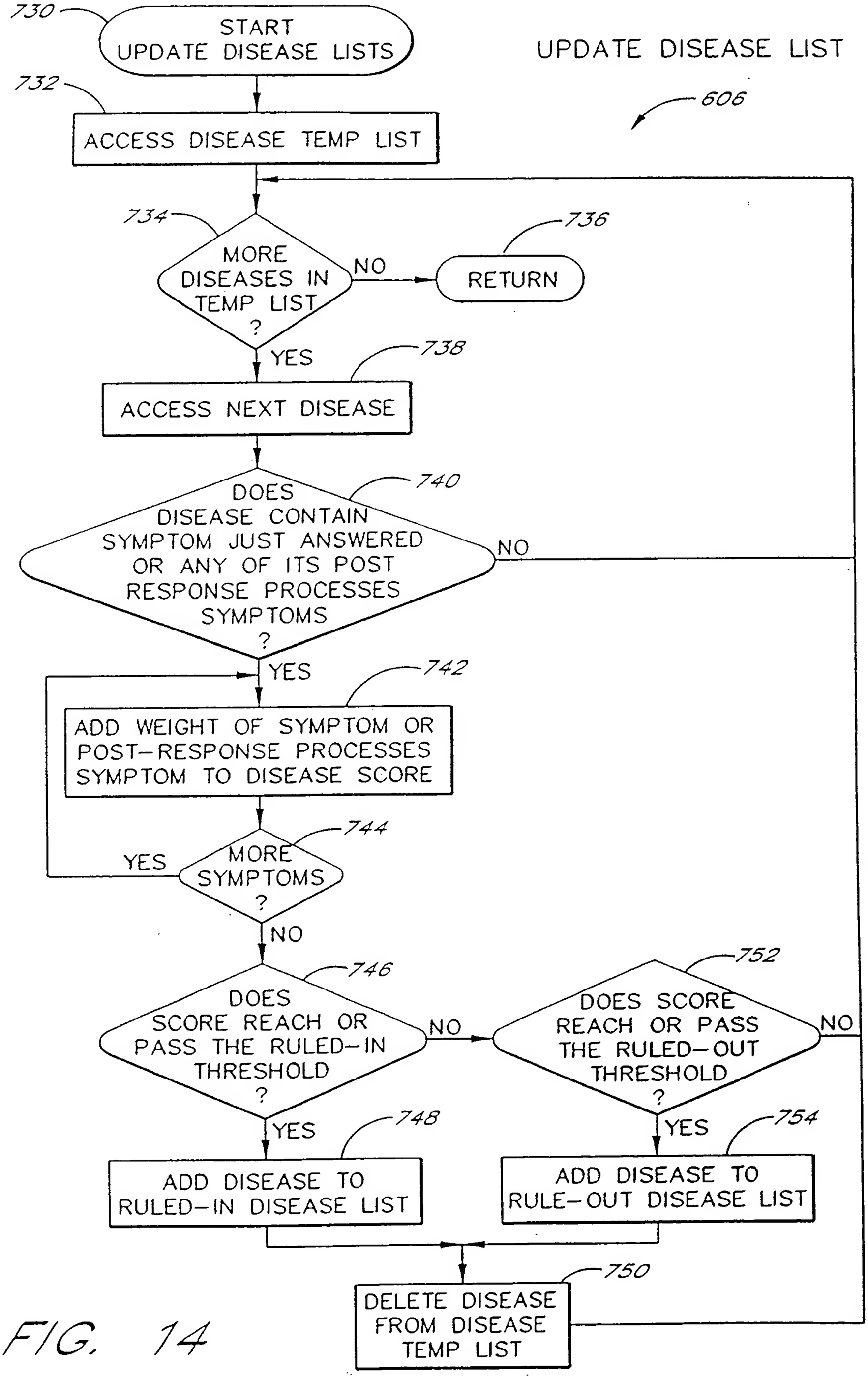
730
START
UPDATE DISEASE LISTS
UPDATE DISEASE LIST
606
732
ACCESS DISEASE TEMP LIST
734
MORE DISEASES IN TEMP LIST ?
NO
736
RETURN
YES
738
ACCESS NEXT DISEASE
740
DOES DISEASE CONTAIN SYMPTOM JUST ANSWERED OR ANY OF ITS POST RESPONSE PROCESSES SYMPTOMS ?
NO
YES
742
ADD WEIGHT OF SYMPTOM OR POST-RESPONSE PROCESSES SYMPTOM TO DISEASE SCORE
744
MORE SYMPTOMS ?
YES
NO
746
DOES SCORE REACH OR PASS THE RULED-IN THRESHOLD ?
NO
752
DOES SCORE REACH OR PASS THE RULED-OUT THRESHOLD ?
NO
YES
748
ADD DISEASE TO RULED-IN DISEASE LIST
YES
754
ADD DISEASE TO RULE-OUT DISEASE LIST
750
DELETE DISEASE FROM DISEASE TEMP LIST

FIG. 14

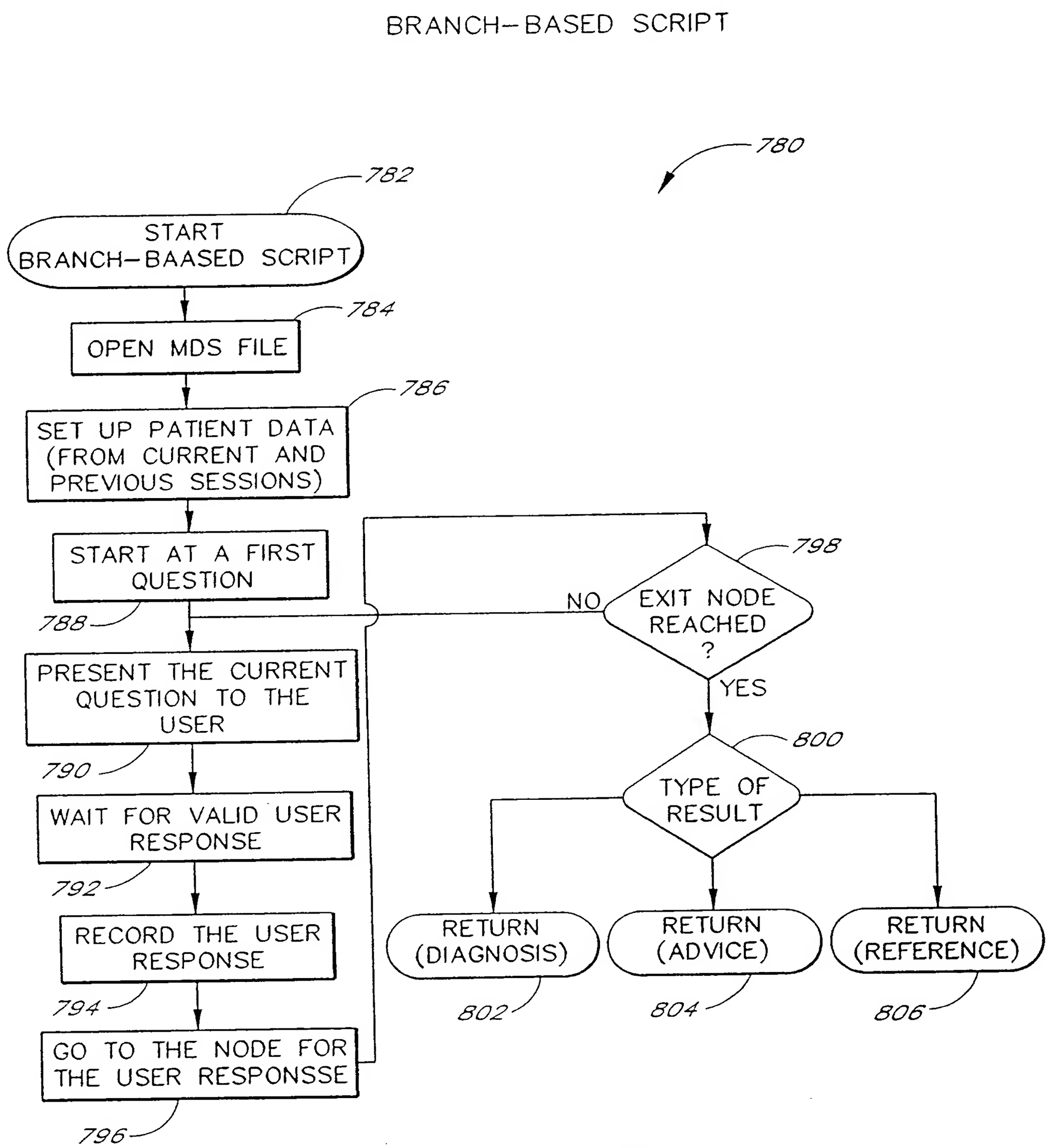
BRANCH-BASED SCRIPT
780
782
START BRANCH-BAASED SCRIPT
784
OPEN MDS FILE
786
SET UP PATIENT DATA (FROM CURRENT AND PREVIOUS SESSIONS)
START AT A FIRST QUESTION
788
PRESENT THE CURRENT QUESTION TO THE USER
790
WAIT FOR VALID USER RESPONSE
792
RECORD THE USER RESPONSE
794
GO TO THE NODE FOR THE USER RESPONSSE
796
798
NO
EXIT NODE REACHED ?
YES
800
TYPE OF RESULT
RETURN (DIAGNOSIS)
802
RETURN (ADVICE)
804
RETURN (REFERENCE)
806

FIG. 15